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DIAMETER GROWTH OF WESTERN WHITE PINE FOLLOWING PRECOMMERCIAL THINNING

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ABSTRACT

Precommercial thinning treatments of western white pine stands in northern Idaho were broadly classified as heavy thinnings and light-to-moderate thinnings. Data from periodic measurements of 35 plots, including unthinned control plots, were analyzed for differences in the diameter growth of potential crop trees. Only heavy thinning produced a significant response. Although the average diameter growth increase did not exceed .03 inch per year, stands thinned at 55 to 65 years of age have maintained this advantage for periods up to 40 years.

Periodic measurements of individual trees have been maintained for as long as 50 years on experimental thinning plots established in northern Idaho stands of the western white pine type. Most of these early studies were unreplicated, but recent analyses of combined data from some of the plots have provided helpful information on general characteristics of western white pine response to release.

From 1914 to 1935, a total of 35 plots ranging from one-tenth acre to one-half acre in size were set aside on the Priest River and Deception Creek Experimental Forests to test various methods and intensities of precommercial thinning. Thirteen of these were left unthinned to serve as control plots, while the remainder were treated as follows:

Type of thinning	No. of plots
Heavy thinning from above	5
Heavy thinning from below	6
Moderate thinning from above	3
Moderate thinning from below	4
Light thinning from above	1
Light thinning from below	3

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In general, the heavy thinnings removed half or more of the basal area, and moderate or light thinnings took less than 40 percent. Ages of the stands at the time of thinning varied from 45 to 65 years old, except for one that was thinned heavily at 20 years of age and another that was thinned moderately at 33 years of age. Periods of recorded measurements ranged from 20 years in stands thinned at the earlier ages to 40 years in stands thinned at ages 55 to 65.

Average annual diameter growth was computed at 5- or 10-year intervals. For comparison of potential crop-tree development, only white pine trees among the largest 200 trees per acre were considered. The relations between the growth of these trees and their average diameter and the age of the stand were analyzed to determine the effect of thinning treatment (figs. 1 and 2). The regression equations used follow:

Heavy thinnings

$$Y = 0.236 - 0.0013\ A;\quad S\bar{y} = 0.030$$
$$Y = 0.232 - 0.0096\ D;\quad S\bar{y} = 0.029$$

Moderate and light thinnings

$$Y = 0.243 - 0.0018\ A;\quad S\bar{y} = 0.017$$
$$Y = 0.262 - 0.0147\ D;\quad S\bar{y} = 0.014$$

No thinning

$$Y = 0.204 - 0.0013\ A;\quad S\bar{y} = 0.024$$
$$Y = 0.213 - 0.0103\ D;\quad S\bar{y} = 0.024$$

where Y is the periodic mean annual growth of potential crop trees, D is the average diameter at breast height of the trees, A is stand age, and $S\bar{y}$ is the standard deviation from regression. D and A were about equally effective in accounting for variation of Y.

The downward trends in white pine growth (figs. 1 and 2) on both heavily thinned and unthinned plots were essentially at the same rate. This mainly reflects a continued benefit of heavy thinning in stands that were 55 to 65 years of age when thinned. Light and moderate thinning appeared to stimulate growth but this effect was short-lived; statistical analysis failed to show any significant difference between subsequent growth in light and moderately thinned plots and growth in the unthinned plots.

The white pine diameter growth in heavily thinned plots was significantly greater (at the 1-percent level of probability) than that in either lightly thinned or unthinned plots. But while the rate of growth averaged more than 20 percent above the rate of growth in unthinned plots, the actual magnitude of difference was only about .03 inch per year.

The results confirmed previous findings that western white pine trees in the dominant portion of second-growth stands respond to late release, but not aggressively.[2] Only thinnings that removed half or more of the stand basal area appeared to provide lasting benefits of consequence. The use of cleaning treatments in white pine stands before they are 20 years old, however, offers considerably more promise as a worthwhile means of accelerating growth.[3]

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[2] Foiles, Marvin W. Effects of thinning a 55-year-old western white pine stand. J. Forest. 54: 130-132. 1956.

[3] Boyd, Raymond J. Cleaning to favor western white pine--its effects upon composition, growth, and potential values. J. Forest. 57: 333-335. 1956.

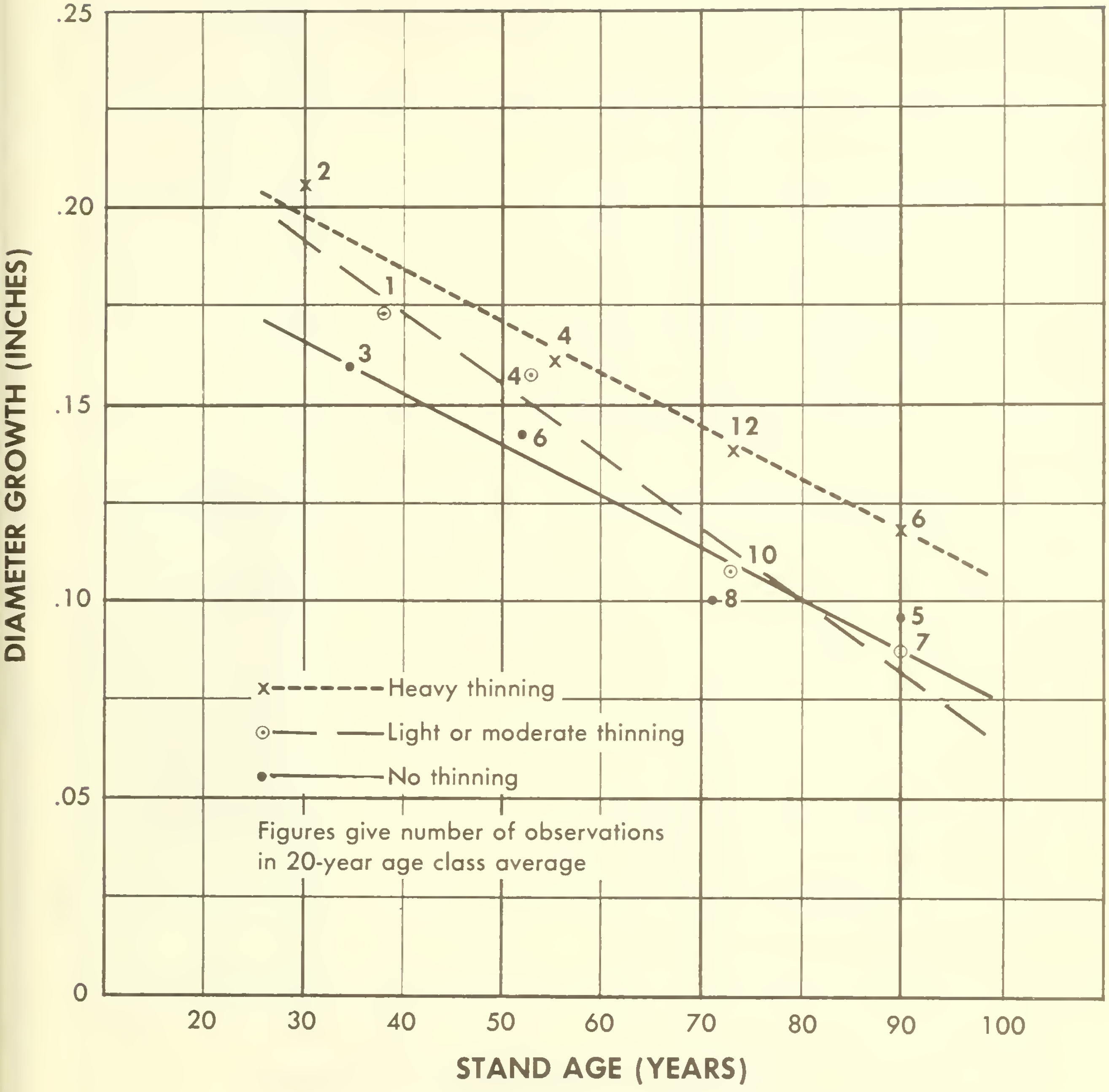

Figure 1.--Periodic mean annual growth in diameter of potential western white pine crop trees as related to stand age in heavily thinned, lightly to moderately thinned, and unthinned plots.

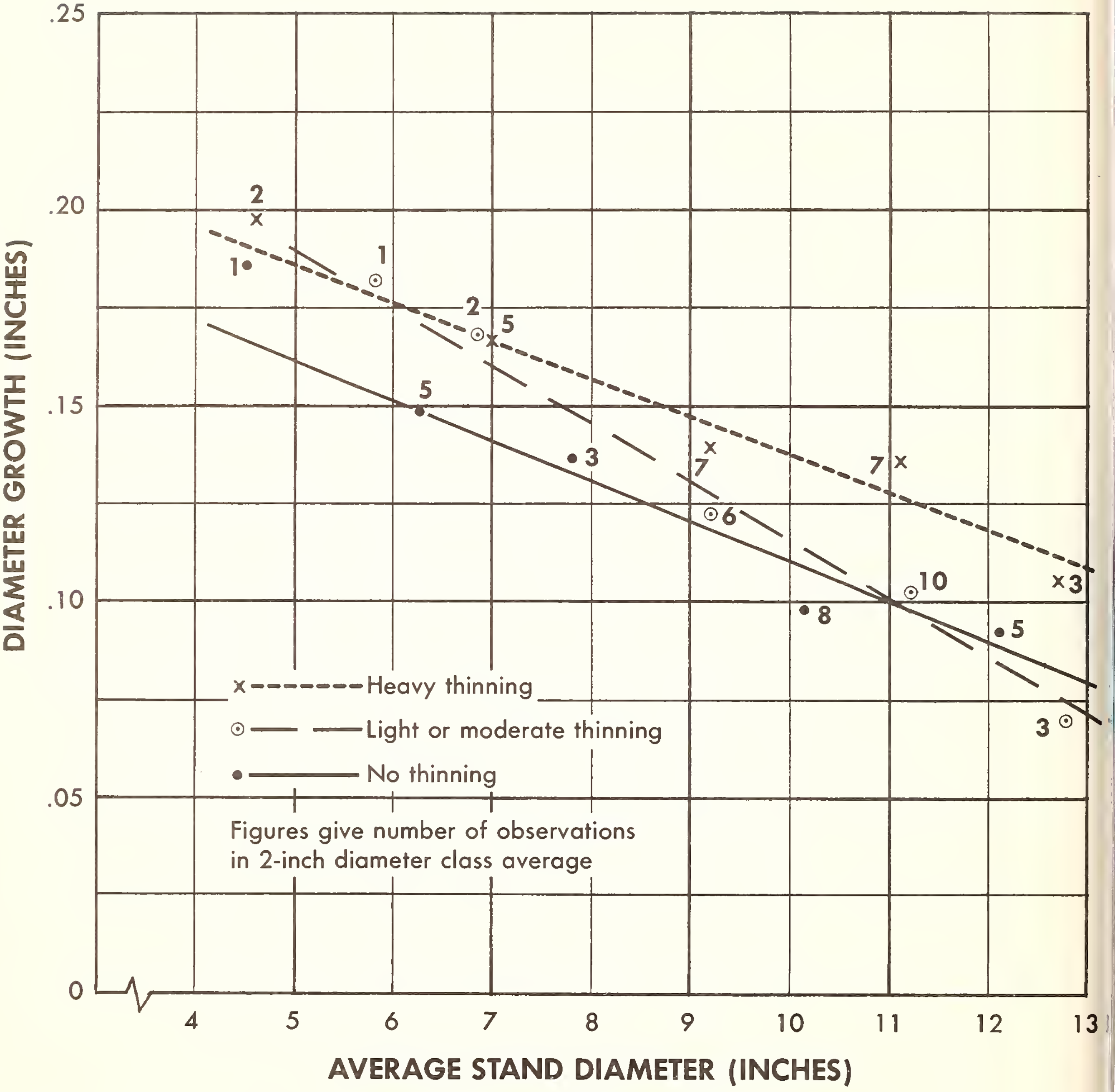

Figure 2.--Periodic mean annual growth in diameter of western white pine crop trees as related to average stand diameter at breast height in heavily thinned, lightly to moderately thinned, and unthinned stands.